



Energy Efficiency and Renewable Energy
Federal Energy Management Program

How to Buy an Energy-Efficient Electric Water Heater

Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR[®] product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.

Federal Supply Source:

- General Services Administration (GSA)
Phone: (817) 978-2316

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
Phone: (800) 363-3732
www.eren.doe.gov/femp/procurement
- American Council for an Energy-Efficient Economy (ACEEE) publishes the *Consumer Guide to Home Energy Savings*.
Phone: (202) 429-0063
aceee.org
- Gas Appliances Manufacturers Association (GAMA) publishes the *Consumer's Directory of Certified Efficiency Ratings*.
Phone: (703) 525-9565
www.gamanet.org
- *Home Energy* magazine provides energy conservation tips.
Phone: (510) 524-5405
www.homeenergy.org
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
Phone: (202) 646-7950

Efficiency Recommendation

Product Type	Recommended		Best Available	
	Annual Energy Use ^a	Energy Factor ^b	Annual Energy Use	Energy Factor
First Hour Rating ^c 35 – 86 gallons	4773 kWh or less	0.92 or more	4622 kWh	0.95

a) Based on DOE test procedure, see 10 CFR 430, Sub-Part B, Appendix E.

b) Energy Factor measures the efficiency of the water heater by comparing the energy supplied in heated water to the total daily consumption of the water heater.

c) First Hour Rating is the amount of hot water the heater can supply per hour (starting with the tank full of hot water).

The federal supply source for residential-scale water heaters is the General Services Administration (GSA), which offers them through its "Special Order" program. Request models that meet this Efficiency Recommendation.

For water heaters purchased through commercial sources (retailer or distributor), look at the yellow "EnergyGuide" label to identify models that meet the recommended level. For a contractor-supplied water heater, specify an estimated annual energy use that meets this Efficiency Recommendation.

Selecting an oversized electric water heater, besides raising purchase cost, will result in increased energy costs due to excessive cycling and standby losses. ACEEE's *Consumer Guide* and GAMA's *Consumer's Directory* provide good, simple guidance on proper sizing of water heaters (see "For More Information").

Depending on the climate and energy prices, a solar-assisted or heat pump water heater may result in substantial energy savings. Where hot water demand is small, one cost-effective option is a "demand" (tankless)

Where to Find Energy-Efficient Electric Water Heaters

Sizing

Technology Options

electric water heater. However, these can provide only a limited hot water flow; the most powerful models generate only between two and three gallons per minute (for reference, most showerheads draw about three gallons per minute; faucets usually draw between two and three gallons per minute at full capacity). Where natural gas is available on site, a gas water heater will almost always be life-cycle cost-effective relative to an electric model.

Energy costs increase with higher water temperature settings; set the temperature at the lowest temperature that allows for sufficiently warm water, usually 110°F to 130°F. Turning electric water heaters down or off during vacations will save significantly on energy costs, also.

User Tips

Electric Water Heater Cost-Effectiveness Example (50 gal. tank, 50 gal. First Hour Rating)

Performance	Base Model ^a	Recommended Level	Best Available
Energy Factor	0.86	0.92	0.95
Annual Energy Use	5106 kWh	4,773 kWh	4,622 kWh
Annual Energy Cost	\$310	\$290	\$280
Lifetime Energy Cost	\$2,900	\$2,700	\$2,600
Lifetime Energy Cost Savings	–	\$200	\$300

a) The efficiency (Energy Factor) of the Base Model is just sufficient to meet current U.S. DOE national appliance standards.

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed water heater life of 13 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Annual energy use in this example is based on the standard DOE test procedure and is calculated assuming an inlet water temperature of 58°F, setpoint of 135°F, daily hot water demand of 64 gallons, and 365 days per year of use. The assumed electricity price is 6¢/kWh, the federal average electricity price (including demand charges) in the U.S.

Using the Cost-Effectiveness Table

In the example shown above, an electric water heater with an energy factor of 0.92 and an annual energy consumption of 4,773 kWh is cost-effective if its purchase price is no more than \$200 above the price of the Base Model. The Best Available model, with an energy factor of 0.95 and an annual energy consumption of 4,622 kWh, is cost-effective if its price is no more than \$300 above the price of the Base Model.

Metric Conversions

1000 Btu/h = 293 watts
1 gallon = 3.8 liters
°F = (1.8 * °C) + 32

What if my Electricity Price is different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings by this ratio: $\left(\frac{\text{Your price in } \text{¢/kWh}}{6.0 \text{ ¢/kWh}} \right)$.

